Amendments to the Claims

The following listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims

1. (Previously presented) A method for removing image artifacts from an image of a scene illuminated by a light source, said image represented by image data, the method comprising;

determining a flicker function, wherein said flicker function is a function of flicker frequency, flicker amplitude and flicker phase of said light source, and

processing said image data using said flicker function so as to remove image artifacts from said image, wherein said image data comprises an image data array comprised of a plurality of rows of image data, and wherein said processing step comprises dividing said image data by said flicker function on a row-by-row basis.

2. (Canceled)

3. (Canceled)

4. (Previously presented) The method according to Claim 1, wherein said step of determining a flicker function includes determining the flicker frequency from a product of frame period and AC line frequency in cycles per image frame.

5. (Original) The method according to Claim 4, wherein said step of determining a flicker function further includes summing pixels of said image data array along every row of said array to create a column vector, and further includes determining said flicker phase and said flicker amplitude by minimizing flicker energy in a corrected column vector.

6. (Original) The method according to Claim 5, wherein said step of minimizing flicker energy in a corrected column vector comprises:

making an estimate of flicker amplitude and phase;

computing a corrected column vector by dividing the created column vector by a flicker function calculated using the determined flicker frequency and the estimated flicker amplitude and phase;

calculating the flicker energy in the corrected column vector;

determining whether the flicker energy can be further reduced; and

if the flicker energy cannot be further reduced, using the estimated flicker amplitude and phase to determine the flicker function, and, if the flicker energy can be further reduced, repeating the steps of making an estimate of flicker amplitude and phase, computing a corrected column vector and calculating the flicker energy until the flicker energy cannot be reduced any further.

7. (Previously presented) The method according to Claim 1, wherein said light source comprises a periodically varying light source.

8. (Original) The method according to Claim 7, wherein said periodically varying light source comprises a fluorescent light source.

9. (Original) The method according to Claim 8, wherein said flicker function, expressed in terms of row number of the rows of said image data array, is:

$$f(j) = 1 + \alpha \sin^2(j\omega T_f / N + \Phi)$$

where α is flicker amplitude, ω is flicker frequency, Φ is flicker phase, T_f is frame period , and N is a number of rows per image frame.

10. (Original) The method according to Claim 1, wherein said image data is collected from a CMOS image sensor utilizing a rolling shutter to provide exposure control.

11. (Previously presented) A method for removing image artifacts from an image of a scene illuminated by a periodically varying light source, said image represented by an image data array comprising a plurality of rows of image data, the method comprising:

determining a flicker function that models light emission of the periodically varying light source, wherein said flicker function is a function of flicker amplitude, flicker frequency and flicker phase of the periodically varying light source, and

processing said image data using said flicker function so as to remove said image artifacts from said image, wherein said step of determining a flicker function includes summing pixels along every row of the image data array to create a column vector, determining the flicker frequency from a product of frame period and AC line frequency in cycles per image frame, and determining flicker amplitude and phase by minimizing flicker energy in a corrected column vector.

12. (Canceled)

13. (Canceled)

14. (Previously presented) The method according to Claim 11, wherein said step of minimizing flicker energy in a corrected column vector comprises:

making an estimate of flicker amplitude and phase;

computing a corrected column vector by dividing the created column vector by a flicker function calculated using the determined flicker frequency and the estimated flicker amplitude and phase;

calculating the flicker energy in the corrected column vector;

determining whether the flicker energy can be further reduced; and

if the flicker energy cannot be further reduced, using the estimated flicker amplitude and phase to determine the flicker function, and, if the flicker energy can be further reduced, repeating the steps of making an estimate of flicker amplitude and phase, computing a corrected column vector and calculating the flicker energy until the flicker energy cannot be reduced any further.

15. (Previously presented) A method for removing image artifacts from an image of a scene illuminated by a periodically varying light source, said image represented by an image data array comprising a plurality of rows of image data, the method comprising:

determining a flicker function that models light emission of the periodically varying light source, wherein said flicker function is a function of flicker amplitude, flicker frequency and flicker phase of the periodically varying light source, and

processing said image data using said flicker function so as to remove said image artifacts from said image, wherein said periodically varying light source comprises a fluorescent light source, and wherein said flicker function, expressed in terms of row number of the rows of said image data array is:

$$f(j) = 1 + \alpha \sin^2(j\omega T_f / N + \Phi)$$

where α is flicker amplitude, ω is flicker frequency, Φ is flicker phase, T_f is frame period, and N is a number of rows per image frame.

16. (Original) The method according to Claim 11, wherein said image data is collected from a CMOS image sensor utilizing a rolling shutter to provide image control.

17. (Previously presented) Apparatus for removing image artifacts from an image of a scene illuminated by a light source, comprising:

a unit for providing image data representing said scene:

a flicker function determiner for determining a flicker function, wherein said flicker function is a function of flicker frequency, flicker amplitude and flicker phase of said light source, and wherein said flicker function determiner includes means for determining said flicker frequency, said flicker amplitude and said flicker phase; and

an image data processor that processes said image data using said flicker function to remove said image artifacts from said image, wherein said image data comprises an image data array comprised of a plurality of rows of image data, and wherein said image data processor processes said image data by dividing said image data by said flicker function on a row-by-row basis.

18. (Canceled)

19. (Canceled)

20. (Original) The apparatus according to Claim 17, wherein said light source comprises a fluorescent light source.

21. (Previously presented) A digital imaging method comprising the steps of:

determining a flicker function by analyzing a digital image; and

processing said digital image using said flicker function so as to reduce image artifacts from said digital image, wherein said determining step involves determining values of parameters associated with an *a priori* flicker model, wherein said parameters comprise a flicker frequency, a flicker amplitude and a flicker phase, and wherein said processing step involves dividing said digital image by said flicker function.

22. (Canceled)

23. (Canceled)

24. (Previously presented) The digital imaging method according to Claim 21, wherein said step of determining flicker frequency, flicker amplitude and flicker phase comprises summing pixels along every row of the image data array to create a column vector, determining the flicker frequency from a product of frame period and AC line frequency in cycles per image frame; and determining flicker amplitude and phase by minimizing flicker energy in a corrected column vector.

25. (Original) The digital imaging method according to Claim 24, wherein said step of minimizing flicker energy in a corrected column vector comprises:

making an estimate of flicker amplitude and phase;

computing a corrected column vector by dividing the created column vector by a flicker function calculated using the determined flicker frequency and the estimated flicker amplitude and phase;

calculating the flicker energy in the corrected column vector;

determining whether the flicker energy can be further reduced; and

if the flicker energy cannot be further reduced, using the estimated flicker amplitude and phase to determine the flicker function, and, if the flicker energy can be further reduced, repeating the steps of making an estimate of flicker amplitude and phase, computing a corrected column vector and calculating the flicker energy until the flicker energy cannot be reduced any further.

26. (Canceled)